

SPECIFICATION

TITLE OF THE INVENTION

“FITNESS SUIT”

RELATED APPLICATION DATA

5 The present application claims priority to U.S. Patent Application Serial No. 60/451,725, filed on March 4, 2003, the disclosure of which in its entirety is herein incorporated by reference.

BACKGROUND OF THE INVENTION

10 The present invention relates to apparatuses and methods for providing fitness to an individual. More specifically, the present invention relates to a lightweight body suit designed with “space age-type” materials to provide wicking and that are highly breathable and further allow for a super-snug, comfortable fit stretching over the torso in a unique manner, wherein the present invention includes connected resistive material to thin, non-stretch points of fixation throughout the body.

15 Over 33% of Americans are considered obese (more than 20 lbs. above their ideal weight), and 60% considered overweight. Simply consuming 100 more calories per day, or taking in 100 calories less per day would, according to some studies, at least stop weight gain for most individuals.

20 Numerous fitness aids have been developed in the past. These include stretch resistance tubing and stretch resistance bands that can be used with a variety of connecting handles, loops or other devices external to the body and its clothing. Such use requires dedication of time and energy with focus on one or a few muscle groups at a time. Exercise devices include devices that cause electrical stimulation leading to repetitive muscle contraction, and use of various wheels and sliding or rowing
25 movement machines to train the abdominal muscles, back, and legs. Weight training is another popular form of exercise, as is aerobic exercise such as jogging. All forms of fitness training to date involve a “workout” requiring a specific time and location dedicated for the specific exercise – usually a relatively vigorous one.

30 In addition, known exercise “suits” involving connections of resistive materials to resilient garments have been described. The concept is induced exercise simply

from wear of such suits. However such designs are impractical both from either the manufacture, difficulty of insertion, difficulty of wear, difficulty of removal, or difficulty of extensive setup protocols to create the desired tension.

For example, body suits exist or are known in general to promote exercise
5 which consist of attachment of resistance materials to resilient ones. They are, however, inadequate for regular use by most, if not all, individuals due to inadequacies such as difficulty of wearing resistive component suit without sliding, movement or torque of the fabric at points of attachment with repetitive movement; difficulty of manufacturing a suit under tension; difficulty of manufacturing a suit with individual
10 adjustment of every resistance attachment; difficulty of adjusting a suit requiring individual adjustment of every resistance attachment both in terms of body symmetry, achieving the correct effective tension for long term wear, extended time required, difficulty of removal, and necessity to repeat the entire process every time the suit is removed simply for necessary private activities such as using the bathroom; difficulty
15 putting on and removing a suit under tension; failure to achieve non-bulky designs to facilitate hours of wear under clothing; failure to achieve a prefabricated symmetry of design and manufacture; failing to address pulmonary fitness potential of such suits; and failing to address lower back support and strengthening opportunity simultaneous with wear of such suits.

20 For a potential wearer of a body suit to be incentivised to make such a body suit a part of their every day routine, or at least some level of regular use – key to success of such designs - these disadvantages are prohibitive. Yet most known body suits are intended for routine wear under clothing despite these limitations.

Known fitness suits not only offer minimal health benefits with their designs,
25 they fail to adequately address the fundamental problem of fixation of resistance materials that must be solved for such an invention to be sufficiently comfortable and functional to the wearer. Resistance materials, because of the nature of their force vectors pulling and tugging on materials, at the force needed for fitness benefit will cause motion and/or discomfort of the material or body part of attachment at the point
30 to which the resistance material is affixed. The material is either induced into sliding, torqueing, rotating or the like at the portion of the garment to which resistive materials are affixed; and/or the underlying body part is under undue pressure from compression

causing discomfort, embarrassment of circulation and in some cases require near emergent removal.

The change in position caused by movement of material at the affixed portion will almost always be in a direction that decreases the effective pull of the resistance material, so functionality is lost, comfort is decreased at the very minimum. Known designs fail to address this problem at all, others rely on elastic compression as the definitive form of fixation for resistive materials. Elastic compression as a fixation and stabilizing mechanism suffers from the requirement of considerable compression to increase the resistance to the stretch on such fixation “bands” that inherently results from attaching resistance materials pulling with force vectors away from their compression. The force of such pull is considerable if there is to be any significant benefit, as this pull provides for the increased work of the muscle group targeted as is desired for increased fitness benefit, so the compression band must provide considerable compression of the tissue it encircles. With prolonged use this can be not only uncomfortable but cause circulation embarrassment and if not then removed possible impairment.

Known products in which all resistance materials are loosely attached and then tightened have the disadvantage of being difficult to manufacture, being cumbersome, bulky in proportion to the number of adjustable resistance connections, difficult to adjust with perfect symmetry of tension as necessary for comfortable and even exercise of the body, and time consuming to put on and remove. A body suit with combined resilient and resistant materials designed for wear under clothing must address the critical private needs of quick removal for purposes of using the bathroom, or other crisis, including simply loosening easily, to increase comfort if being worn under clothing in a work situation or other environment where removal is not possible.

SUMMARY OF THE INVENTION

The present invention relates to apparatuses and methods for providing fitness to an individual. More specifically, the present invention relates to a lightweight body suit designed with “space age-type” materials to provide wicking and are highly breathable and further allow for a super-snug, comfortable fit stretching over the torso in a unique manner, wherein the present invention includes connected resistive material to thin, non-stretch points of fixation throughout the body.

The present invention results in increased energy expenditure and optimized posture and breathing barely noticed on a second to second basis. Worn throughout the day these benefits are amplified into a revolutionary new form of exercise. This is most similar to allowing your entire body the benefits of a brisk walk that lasts the
5 entire day, every single day it is worn, even for entire workdays.

The present invention is a specially designed and constructed "body suit" that can be worn under clothing to convert normal daily activity into a powerful fitness program, or during workouts to improve the effectiveness of most exercise programs. With regular use it reshapes and revitalizes the body in a uniquely natural way,
10 converting natural movements of the body into a novel form of exercise. The present invention provides low impact, low resistance, endurance training that not only combines cardiovascular fitness and musculo-skeletal development but a variety of other health benefits as well. As the added exertion occurs virtually every minute of wear, over an infinite pattern of body movements, the result is work effort that while
15 not exhaustive on a second to second basis, accumulated over many hours produces a powerfully amplified novel form of exercise.

The unique design of the invention, in an embodiment, is based on subdivision of the suit into a non/minimal stretch harness system connected to fixed points on the body like shoulders, chest, waist, and knees; stretch/resistance material primarily in
20 prefabricated sections or panels built into the top and shorts, connecting to the harness system, that zip or are easily hooked or similarly affixed into place. The suit is easily slipped on in its unzipped state, and with minimal effort the panels are easily zipped (or hooked, etc.) to completely seal the torso of the user (upper and lower body), and with minimal additional effort for the most part simply to snap the connected
25 tightening bands to thereby achieve the fully effective completely functional body suit that comprises the present invention. A "trapped door" zipped or snapped bottom can optionally further facilitate ease of opening for routine bathroom use.

The present invention, in an embodiment, allows exercise during routine wear because it uses breathable wicking materials while its zippered paneled construction
30 with adjustable snaps simplifies manufacture of materials via construction in a non-stretch state; suit entry and exit facilitated by ease with which the zippered panels allow release or actuation of tension; custom fit and adjustment of tension via the

zippered panels and adjustable snaps; it eliminates problems of slippage and sliding of materials compared to any previous body suit designs, and adds means for improving breathing and posture not previously found in a body suit design.

5 In an embodiment, the present invention provides apparatuses and methods for exercising muscles of the body. The present invention, in an embodiment, includes a body suit that includes 1) materials that are largely resistant to stretch and are for the most part interconnected to each other as well as affixed to parts of the body to prevent sliding or slippage (called harness bands individually and a harness system collectively); and 2) materials that can be stretched such that they offer resistance to
10 such stretch to create a force of contraction that is retained for as long as kept on stretch called resistive materials that are connected while on stretch to harness bands individually and/or to the harness system collectively; to effect 3) a pull on the body part to which the harness band is connected that results in contraction of muscles connected to that body part to allow it to resist the pull on it and/or retain a normal
15 anatomical position.

In an embodiment, such contraction is low resistance and low impact, and is maintained for as long as the suit is worn.

In an embodiment, the harness system includes bands connected to the shoulders, chest, waist, thighs, knees and/or the like.

20 In an embodiment, more than one harness band is interconnected to another with similar material to further strengthen the affixation to a body part and minimize slippage, such as the shoulder harness being interconnected with the chest harness band; and/or the chest harness being interconnected to the waist harness band; or the waist harness band, thigh harness band and knee harness band being interconnected.

25 In an embodiment, the connection between the harness band and resistance panel is a zippered seam.

In an embodiment, the connection between the harness band and resistance panel is a zippered seam with a nonstretch border of its own.

30 In an embodiment, the muscle groups are placed on sufficient tension requiring a higher degree of contraction than normal to maintain useful normal body movement.

In an embodiment, the material is either a breathable supplex Nylon (Dupont); Avalanche Lite®, or a nylon polyester mixture.

In an embodiment, the resistance material is either DF –2041 Tyvek Coated (Xymid, LLC Wear Force G (Xymid, LLC); Wear Force F!!(Xymid LLC); DF – 1562 (Xymid LLC); Lycra® Power; Polartec Stretch-Rx; Interface® B Stretch; Reflex™; Performax with stomatex®, Elcross® or other similar composite stretch material with
5 properties of wicking and breathing;

In an embodiment, the design includes a lamellar (layered) accordion, honeycomb, or similar pattern along each layer of resistance material such that in its natural state the sum total material is compressed, but under stretch allows for stretch of 5x of its thickness or more to provide increased resistance at joints during their
10 range of motion.

In an embodiment, the base material is breathing and wickable such as Drytex 2000®, Microzone® (Louis Garneau); Dri-on with OFT® (Montbell); Coolmax® polyester; Coolmax® Ultracool RVU; Wickaways®; Malden Mills Bipolar 100; Tencel®' Ultrex®; Lycrapower®; Polyester/spandex of about 85/15 ratio; rayon and
15 lycra of about 85/15 ration; cotton and lycra; or other similar materials.

In an embodiment, the body suit can be worn optionally under outer clothing to allow for exercise during routine daily activity.

In an embodiment, the body suit includes a top and shorts connected at the waist via a zippered seam, snaps or other similar connection.

20 In an embodiment, opposing muscle groups can be adjusted to tension-nontension pairs to optimize muscular contraction of specific groups, for example upper chest versus upper back muscles.

In an embodiment, the force provided by the stretch/resistive material and adjustable connections is between about 2 lbs. and 20 lbs.

25 In an embodiment, the force provided by the stretch/resistive material and adjustable connections is between about 4 lbs. and 14 lbs.

In an embodiment, the force provided by the stretch/resistive material and adjustable connections is about 10 lbs.

30 In an embodiment, a material is used to bridge the connection from one side of the zippered seam's border to the harness band on the other side by means of a fixed length of non-stretch or highly resistant stretch material being affixed to one border

and stretched for a length that can be adjusted by the wearer on the other side, preferably to the harness band itself.

In an embodiment, such bridging material takes tension off of the zippered seam to decrease wear and tear on its materials.

5 In an embodiment, such bridging material allows the wearer to adjust the tension as desired and where such connection to the harness band may be by means of snaps such as Snapet® sw, sx, sg; Velcro or other similar means of adjustment.

In an embodiment, the zippered seam may be a doubled zippered seam so that the wearer can set the tension to either high or low by zippering the bordering
10 resistance panel on either high or low stretch.

In an embodiment, the zippered seam allows for manufacture of the body suit as well as entry into the body suit at low tension.

In an embodiment, both zippered panels as well as bridging material is affixed from one side and stretched over to the other for a degree of stretch adding tension
15 onto the harness band to further allow custom fit and tension adjustment.

In an embodiment, each harness band has an elastic section at one point and bridging material over it allowing custom fit of the harness band and then adjustment to result in a snug but not uncomfortable affixed band around and to the affixed body part.

20 In an embodiment, resistance tubing or bands may be connected to the harness bands.

In an embodiment, a series of adjustable snaps, zippered, or double-zippered seam on front and back, plus adjustable snaps or similar bridge connections on either side of zippered seams, allows for customizing maximal tension versus relaxation of
25 opposing muscle group pairs, such as maintaining tension on upper chest muscles and relaxation of upper back muscles.

In an embodiment, the resistance tubing or bands are affixed to a side harness along the side harness between the waist and knee at a distance adjusted by the wearer, then up along the side through a connecting short tube along the lateral side of the
30 upper chest panel, across a short distance under the armpit to a similar short tube along the upper arm band on its medial side to the chest connecting tube; and down to the elbow harness along its medial side.

In an embodiment, routine bipedal gait movement results in opposing movement of the arms and legs to increase stretch on the resistance tubing or band and further increase muscle contraction and caloric expenditure.

5 In an embodiment, such connection allows the option of the wearer to use the body suit under normal clothing.

In an embodiment, optionally additional attachments of harness bands below the knee or even to the feet allow for resistance to be applied to muscles of the leg in similar fashion.

10 In another embodiment, the present invention provides apparatuses and methods for applying circumferential tension on the rib cage via a chest compression band such that with each expiration a more complete exhalation results.

In an embodiment, the chest compression and more complete exhalation result in increase in diaphragmatic breathing on inhalation.

15 In an embodiment, their results a greater degree of inhalation and expansion of the lung, particularly the lower lobes of the lung.

In an embodiment, there is increased air exchange, resulting in up to 200 additional pints of air each day.

In an embodiment, the typical shallow respirations of primarily rib cage breathing become deeper, more efficient, and produce greater relaxation.

20 In an embodiment, greater quality of sleep results.

In an embodiment, the average caloric expenditure breathing of about 900 calories per day via over 15,000 breaths per day is increased.

In an embodiment, the muscles of respiration acquire improved strength and tone.

25 In an embodiment, elastic or other similar stretch material is used for the chest compression band.

In an embodiment, adjusting bands may be snapped, velcro'd or otherwise affixed at various distances to further adjust tension of the chest compression band.

30 In an embodiment, the force of contraction is between about 1 and about 14 lbs.

In an embodiment, the force of contraction is between about 2 and about 12 lbs.

In an embodiment, the force of contraction is about 8 lbs.

In yet another embodiment, the present invention provides apparatuses and methods for improving posture by minimizing hunching forward of the shoulders and effecting a pull backwards on the shoulders to a more erect position via a shoulder
5 stabilizing band connecting non or minimal stretch material such as a harness band affixed to the shoulders or connected otherwise directly to the shoulders with the other end on stretch so tension results with connection affixed backwards to the back of the waist, chest or other body part that will prevent slippage or sliding upwards.

In an embodiment, the curvature of the back is improved by minimizing and/or
10 preventing forward curvature (lordosis); and promoting a normal "s" curvature at and near the sacroiliac junction rather than a rounded convex curvature from forward slouching.

In an embodiment, the pull backwards on the shoulders would result in a posture a few degrees backwards of vertical, forcing the abdominal muscles to contract
15 and thereby be exercised and strengthened with a low resistance low impact endurance form of exercise to maintain a vertical posture.

In an embodiment, the pull backwards on the shoulders and resulting improved posture and abdominal muscular strength result in less spasm of the muscles of the lower back, and improved normal opposing muscle force within the lower back from
20 the improved position of the lower spine.

In still yet another embodiment, the present invention provides apparatuses and methods for improving the general health, fitness and well-being of an individual comprising a body suit with 1) a means of affixing resistance materials on stretch to various body parts to effect muscular contraction and increased oxygen consumption;
25 2) a means of increasing exhalation during each breathing cycle via chest compression to improve pulmonary fitness and O₂ absorption; and 3) a means of improving posture, back curvature, and lower back strength by pulling minimizing hunching forward of the shoulders via back stabilizer bands connecting the shoulders on tension backwards at the back of the waist, chest, or other similar region and increasing abdominal tone to
30 keep posture from going backwards of vertical.

In an embodiment, thousands of routine body movements, breaths with increased rib cage resistance to expansion and additional abdominal contractions to keep posture stabilized result in increased caloric expenditure.

5 In an embodiment, the basal metabolic rate increases while wearing the body suit.

In an embodiment, the present invention is used for promoting improved recovery from stroke or other neurologic impairment affecting muscular strength and/or coordination during routine daily activity.

10 In an embodiment, the present invention is used for improving health and fitness in a reduced gravity or gravity free environment.

In an embodiment, the present invention provides increasing weight loss during routine daily activity by increasing energy expenditure results.

In an embodiment, the present invention provides for improved sleep quality and duration result.

15 In an embodiment, the present invention provides for improved health and fitness can be maintained during use in confined environments.

In an embodiment, individuals who are overweight, obese, or otherwise unfit can obtain dramatically increased fitness levels without specific exercise programs other than wearing the present invention during their daily activities provided they maintain a minimum level of routine, daily, normal body movement. For example, the present invention includes a core garment for the upper torso and lower torso. In an embodiment, shorts and ¾ sleeve top using a breathable material such as Drytex 2000®, Microzone® (Louis Garneau); Dri-on with OFT® (Montbell); Coolmax® polyester; Coolmax® Ultracool RVU; Wickaways®; Malden Mills Bipolar 100; 25 Tencel®; Ultrex®; Lycrapower®; Polyester/spandex of about 85/15 ratio; rayon and lycra of about 85/15 ration; cotton and lycra; or other similar materials. Alternatively, the suit may be constructed as a one-piece body suit. The two-piece shorts and top embodiment will be discussed below.

30 In a further embodiment, the present invention provides an apparatus for exercising muscles of a body. The apparatus includes a body suit including one or more non-stretch or non-stretchable materials that are largely resistant to stretch and are interconnected to each other as well as affixed to one or more parts of the body to

prevent sliding or slippage; and one or more stretch or stretchable materials that can be stretched such that they offer resistance to stretching thereby creating a force of contraction that is retained for as long the materials are stretched, wherein the non-stretch and stretch materials are connected and so configured and arranged to cause
5 pulling on the body or part thereof to which the non-stretch material is connected thereby resulting in contraction of muscles connected to the body or part thereof allowing the muscles to resist the pulling and/or retain a normal anatomical position.

In an embodiment, the contraction is performed at a low resistance and a low impact, and can be maintained for as long as the body suit is worn.

10 In an embodiment, the non-stretch materials include a harness system that includes one or more bands connected to one or more parts of the body including shoulders, chest, waist, thighs, knees and/or the like.

In an embodiment, the harness system includes a plurality of harness bands that are interconnected with a similar material to further strengthen affixation to the body
15 part and minimize slippage, and wherein the harness bands include at least one of a shoulder harness that is interconnected with a chest harness band, the chest harness being interconnected to a waist harness band, and the waist harness band, a thigh harness band and a knee harness band being interconnected.

In an embodiment, the connection between the harness band and a non-stretch
20 material including a resistance panel that includes a zippered seam.

In an embodiment, the connection between the harness band and a resistance panel includes a zippered seam that has a nonstretch border.

In an embodiment, one or more muscle groups are subjected to a sufficient amount of tension that requires a higher degree of contraction than normal to maintain
25 a useful normal body movement.

In an embodiment, the body suit includes at least one of a breathable supplex Nylon (Dupont); Avalanche Lite®, and a nylon polyester mixture.

In an embodiment, the body suit includes at least one of DF -2041 Tyvek Coated (Xymid, LLC Wear Force G (Xymid, LLC); Wear Force F!!(Xymid LLC); DF
30 - 1562 (Xymid LLC); Lycra® Power; Polartec Stretch-Rx; Interface® B Stretch; Reflex™; Performax with stomatex®, Elcross®, and a similar composite stretch material with properties of wicking and breathing.

In an embodiment, the body suit includes a design with at least one of a lamellar pattern, an accordion pattern, and a honeycomb pattern along each layer of a resistance material such that in a natural state a sum total material is compressed, but under stretch allows for stretch of about five times of a thickness thereof or more to provide increased resistance at joints throughout a range of motion.

In an embodiment, the body suit includes a base material that is breathable and wickable and selected from the group consisting of Drytex 2000®, Microzone® (Louis Garneau); Dri-on with OFT® (Montbell); Coolmax® polyester; Coolmax® Ultracool RVU; Wickaways®; Malden Mills Bipolar 100; Tencel®; Ultrex®; Lycrapower®; Polyester/spandex of about 85/15 ratio; rayon and lycra of about 85/15 ratio; cotton lycra and the like.

In an embodiment, the body suit can be worn optionally under outer clothing to allow for exercise during routine daily activity.

In an embodiment, the body suit includes a top and shorts connected at a waist via at least one of a zippered seam and snaps.

In an embodiment, one or more opposing muscle groups can be adjusted to one or more tension-nontension pairs to optimize muscular contraction of specific groups that include an upper chest/upper back muscle group.

In an embodiment, a force provided by a stretch/resistive material of the body suit and adjustable connections thereof ranges from about 2 lbs. to about 20 lbs.

In an embodiment, the force provided by the stretch/resistive material and adjustable connections thereof ranges from about 4 lbs. about 14 lbs.

In an embodiment, the force provided by the stretch/resistive material and adjustable connections thereof is about 10 lbs.

In an embodiment, a material is used to bridge the connection from one side of a zippered seam's border to a harness band on another side by a fixed length of non-stretch or highly resistant stretch material being affixed to one border and stretched for a length that can be adjusted by a wearer of the body suit on the other side include via the harness band itself.

In an embodiment, a bridging material takes tension off of a zippered seam to decrease wear and tear on its materials.

In an embodiment, a bridging material allows a wearer to adjust the tension as desired and wherein a connection to the harness band be made by snaps including at least one of Snapet® sw, sx, sg; Velcro and the like.

5 In an embodiment, a zippered seam can be a doubled zippered seam so that a wearer can set a tension to either high or low by zippering a bordering resistance panel on either high or low stretch.

In an embodiment, the zippered seam allows for manufacture of the body suit as well as entry into the body suit at low tension.

10 In an embodiment, a pair of zippered panels as well as a bridging material is affixed from one side and stretched over to the other for a degree of stretch adding tension onto a harness band to further allow custom fit and tension adjustment.

In an embodiment, a harness band has an elastic section at one point and a bridging material over it allowing custom fit of the harness band and then adjustment to result in a snug but not uncomfortable affixed band around and to an affixed body
15 part.

In an embodiment, one or more resistance tubing or bands can be connected to the harness bands.

In an embodiment, a series of adjustable snaps, zippered, or double-zippered seam on front and back, in addition to adjustable snaps on either side of the zippered
20 seams allows for customizing maximal tension versus relaxation of opposing muscle group pairs including maintaining tension on upper chest muscles and relaxation of upper back muscles.

In an embodiment, a resistance tubing or bands are affixed to a side harness along the side harness between a waist and knee at a distance adjusted by a wearer of
25 the body suit, then up along a side through a connecting short tube along a lateral side of an upper chest panel, across a short distance under an armpit to a similar short tube along an upper arm band on its medial side to a chest connecting tube; and down to an elbow harness along a medial side thereof.

In an embodiment, a routine bipedal gait movement results in opposing
30 movement of arms and legs to increase stretch on a resistance tubing or band and further increase muscle contraction and caloric expenditure.

In an embodiment, a connection allows an option of the wearer to use the body suit under normal clothing.

In an embodiment, optionally additional attachments of one or more harness bands below a knee or even to a foot allows for resistance to be applied to muscles of a
5 leg in similar fashion.

In yet a further embodiment, the present invention provides an apparatus for applying circumferential tension on a rib cage. The apparatus includes a chest compression band so configured and designed that is capable of providing a more complete exhalation with each expiration.

10 In an embodiment, the chest compression and more complete exhalation result in increase in diaphragmatic breathing on inhalation.

In an embodiment, a greater degree of inhalation and expansion of a lung including lower lobes of the lung can result.

In an embodiment, an increased air exchange can result in up to about 200
15 additional pints of air each day.

In an embodiment, a typical shallow respiration of primarily rib cage breathing can become deeper, more efficient, and produce greater relaxation.

In an embodiment, a greater quality of sleep results.

In an embodiment, an average caloric expenditure breathing of about 900
20 calories per day via over 15,000 breaths per day is increased.

In an embodiment, one or more muscles of respiration acquire improved strength and tone.

In an embodiment, the chest compression band includes an elastic material.

In an embodiment, one or more adjusting bands can be affixed including at
25 least one of snapped and velcro'd at various distances to further adjust tension of the chest compression band.

In an embodiment, a force of contraction ranges from about 1 lbs. to about 14 lbs.

In an embodiment, a force of contraction ranges from about 2 lbs. to about 12
30 lbs.

In an embodiment, a force of contraction is about 8 lbs.

In still a further embodiment, the present invention provides an apparatus for improving posture by minimizing hunching forward of shoulders and effecting a pull backwards on the shoulders to a more erect position. The apparatus includes a shoulder stabilizing band that connects non or minimal stretch material including a harness band affixed to the shoulders with another end on stretch so tension results with a connection affixed backwards to a back of a body or part thereof including a waist and chest that is capable of preventing slippage or sliding upwards.

In an embodiment, a curvature of a back is improved by minimizing and/or preventing forward curvature and promoting a normal "s" curvature at and/or near a sacroiliac junction rather than a rounded convex curvature from forward slouching.

In an embodiment, a pull backwards on the shoulders would result in a posture at a few degrees backwards of vertical thereby forcing one or more abdominal muscles to contract allowing exercise and strengthening with a low resistance low impact endurance form of exercise to maintain a vertical posture.

In an embodiment, the pull backwards on the shoulders and resulting improved posture and abdominal muscular strength results in less spasm of the muscles of the lower back, and improved normal opposing muscle force within a lower back from the improved position of the lower spine.

In another embodiment, the present invention provides an apparatus for improving a general health, fitness and well-being of an individual. The apparatus includes a body suit including means for affixing resistance materials on stretch to various body parts to effect muscular contraction and increased oxygen consumption; means for increasing exhalation during each breathing cycle via chest compression to improve pulmonary fitness and O₂ absorption; and means for improving posture, back curvature, and lower back strength by pulling minimizing hunching forward of the shoulders via one or more back stabilizer bands connecting the shoulders on tension backwards at the back of a body part including at least one of a waist and a chest thereby increasing abdominal tone to keep posture from going backwards of vertical.

In an embodiment, a plurality of routine body movements, breaths with increased rib cage resistance to expansion and additional abdominal contractions to keep posture stabilized upon wear and use of the apparatus can result in increased caloric expenditure.

In an embodiment, a basal metabolic rate can increase while wearing the body suit.

In an embodiment, the body suit can be used for promoting an improved recovery from stroke or other neurologic impairment affecting muscular strength
5 and/or coordination during routine daily activity.

In an embodiment, the body suit can be used for improving health and fitness in a reduced gravity or gravity free environment.

In an embodiment, weight loss can be increased during routine daily activity with the apparatus by increasing energy expenditure.

10 In an embodiment, the body suit can provide an improved sleep quality and duration upon use of same.

In an embodiment, the body suit can provide for an improved health and fitness during use in confined environments.

In an embodiment, a “trap door” bottom that is zipped or snapped allows for
15 routine bathroom use without even unzipping or otherwise needing to pull down the entire suit.

In an embodiment, an overweight and/or unfit individual can obtain increased fitness levels without a specific exercise program other than wearing the body suit during daily activities provided a minimum level of routine, daily, normal body
20 movement is maintained.

An advantage of the present invention is to provide apparatuses, methods and the like that can be utilized to improve the general health, fitness and well-being of an individual.

Another advantage of the present invention is to provide apparatuses, methods
25 and the like that can be utilized to provide exercise during daily activities where a minimum level of routine, daily, normal body movement is maintained.

Yet another advantage of the present invention is to provide apparatuses, methods and the like that can be utilized to improve breathing functions.

Yet still another advantage of the present invention is to provide apparatuses,
30 methods and the like that can be utilized to improve posture thereby protecting the lower back and/or other body parts from injury.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the figures.

BRIEF DESCRIPTION OF THE FIGURES

5 Fig. 1 is a front perspective view of the harness system of an embodiment of the fitness suit of the present invention.

 Fig. 2 is a side elevational view of the side harness member of the fitness suit of Fig. 1.

 Fig. 3 is a front perspective view of the fitness suit of Fig. 1 with the suit in the
10 zipped configuration.

 Fig. 4 is front perspective view of the fitness suit of Fig. 1 including the suit panels and with the suit in the unzipped configuration.

 Fig. 5 is a back perspective view of the fitness suit of Fig. 3 with the suit in the unzipped configuration.

15 Fig. 6 is an enlarged view of a zippered seam of the suit of Fig. 3 in the unzipped configuration.

 Fig. 7 is the zippered seam of Fig. 6 in the higher tension zippered configuration.

 Fig. 8 is the zippered seam of Fig. 6 in the lower tension zippered
20 configuration.

 Fig. 9 is a front perspective view of the suit of Fig. 1 showing the compression/resistance bands.

 Fig. 10 is a front perspective view of the suit of Fig. 9 showing additional optional features.

25 Fig. 11 is a rear elevational view of the suit of Fig. 1 showing the back stabilizer and lower thigh bands.

 Fig. 12 is a rear perspective view of the suit of Fig. 1 showing the snaps of the suit and the suit and the zipped and snapped configuration.

 Fig. 13 is a front perspective view of the suit of Fig. 12 showing the snaps of
30 the suit and suit in the zipped and snapped configuration.

 Figs. 14A, 14B, 14C and 14D illustrate schematic views of various parts of the body suit according to an embodiment of the present invention.

Fig. 15 illustrates a schematic view of the harness materials of the body suit according to an embodiment of the present invention.

Figs. 16A and 16B illustrate schematic views of the harness materials of the body suit according to an embodiment of the present invention.

5 Figs. 17A and 17B illustrate schematic views of the chest compression band of the body suit according to an embodiment of the present invention.

Figs. 18A and 18B illustrate schematic views of the back stabilizer bands of the body suit according to an embodiment of the present invention.

10 Figs. 19A and 19B illustrate schematic views of the resistance bands/harness/zipper/flap connections of the body suit according to an embodiment of the present invention.

Figs. 20A and 20B illustrate harness/resistance band/zipper junctions of the body suit according to an embodiment of the present invention.

15 Figs. 21A and 21B illustrate a double harness of the body suit according to an embodiment of the present invention.

Figs. 22A and 22B illustrate belt/waistband attachments of the body suit according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

20 The present invention relates to apparatuses, methods and the like for providing fitness to an individual. More specifically, the present invention relates to a lightweight body suit designed with "space age-type" materials to provide wicking and highly breathable and further allow for a super-snug comfortable fit stretching over the torso in a unique manner, wherein the present invention includes connected resistive material to thin nonstretch points of fixation throughout the body.

25 In an embodiment, the present invention provides for attachment of resistance tubing, bands, or other similar material used to exercise muscle groups to harness bands or an entire harness band system; where the harness bands are a proprietary means of attachment to material on the fitness suit without the material sliding, rotating, or otherwise failing to remain in position.

30 The harness bands or fixation points of the suit are shoulder; chest, waist, and knees. By using nonstretch materials, creating a harness pattern for example around the shoulders with such material, and using cinches to tighten bands under knees and

elbows, around the waist, these anatomical points can be used to create anchors for the harness system.

The average individual engages in thousands of movements of the torso and extremities under normal conditions that are near resistance free; but by attaching
5 resistance to the harness bands at the chest or upper back; underarms; vertically from shoulder to waist along either side; and optionally along either upper arm; from the back of the waist wrapped around both legs and cinched below the knee dramatic increase in resistance to routine movement creates a fitness suit that transforms ordinary movement into low impact low resistance exercise throughout the time period
10 the suit is worn. Expenditure of calories and unique muscular workout result from repeated movements thousands of times with increased low resistance.

The average individual expends about 800 calories of their basal metabolism simply performing daily activities. This can be substantially increased when said fitness suit is worn and such attachments are maintained for extended time periods
15 such as throughout a workday with the fitness suit worn as an undergarment.

In an embodiment, the present invention provides for protecting the lower back and improving posture by preventing and/or minimizing hunching forward that causes the lower back to lose its lumbar arch; via attachment to the shoulder and chest harness bands of resistance stretch material from the upper portion of the shoulder
20 harness band to the back of the waist harness band and/or waist side harness band intersection; to result in a pulling backward of the shoulders and arching backward of the back a few degrees back of vertical; so that the individual will increase abdominal tone to keep the posture vertical thereby both enhancing abdominal tone and maintaining the lumbar arch, preventing and/or reversing abnormal long term
25 curvature loss to the lumbar spine called kyphosis.

In an embodiment, the present invention can provide improved breathing, such as a more complete exhalation with each expiration. The average individual breathes about 15,000 to 20,000 times per day and expends about 900 calories of their basal metabolism simply breathing. The respiratory bands cause both maximal increased
30 degree of exhalation – so more air is inhaled and exhaled; and increase resistance to inhalation in two ways as well, increasing the caloric expenditure breathing considerably – 100 to 300 calories being an average increase expected. An inner band

includes a low resistance stretch band that is cinched over the chest along the sternum on maximal inhalation. This causes increased but low resistance to the full range of inhalation. A separate band overlying this one has a much higher resistance and is set at/or near maximal inhalation, meaning near the maximal circumference of the chest on maximal inhalation. The user determines how close to full inhalation to set this outer high resistance band. The result is greatly increased expenditure of effort to fully inhale. The dual bands therefore increase resistance to breathing in a manner that on the one hand increases expenditure of calories to breathe and exercises muscles of respiration while encouraging much more air exchange; and on the other is not suffocating because the resistance to breathing is only high for a small portion of the breathing cycle, and is adjustable.

The present invention provides such possibility and more with a paradigm shift in exercise requirement – simply putting it on and continuing normal routine daily activities while wearing it on a regular basis. The body suits of the present invention provide comfort, ease of manufacture, entry, exit, avoiding slippage and/or the like.

It is believed that no single exercise program in the world could reproduce the infinite variety of body movements of the invention. The invention provides the first functional translation of natural coordinated muscular activity from routine movement into improved metabolism and productive physical exercise for hours at a time. It is the first 'body suit' optimizing health & fitness with routine wear via 1) low impact low resistance strength training; 2) improved O₂ intake, consumption, and quality of sleep; 3) improved posture and lower back strength; 4) worn regularly ~ 6,000 + calories /mo. of increased caloric expenditure and in most cases higher basal metabolic rate.

In general, there are four main features to the present invention: 1) The Harness System affixing non or minimal stretch material to various parts of the body (particularly the shoulders, chest, upper arms, elbows, wrist, waist, thighs, knees and/or the like) as well as interconnecting seams to various components; 2) The Harness–Zipper–Flap panels (sections) connecting resistive materials to the harness system; 3) The mild-moderate Chest Compression Band increasing rib cage compression during exhalation; and 4) The Back Support Stabilizer Bands for improved posture.

Harness System

Harness system materials are designed to be tough and durable. They may include a breathable supplex Nylon (Dupont); Avalanche Lite®, a nylon polyester mixture or the like.

5 Connected to the core garment is the largely interconnected *harness system*[™], indicated in general at 10 in Fig. 1. The top portion of the suit is indicated at 11 while the shorts are indicated at 13.

 With reference to Figs. 1 and 2, the harness system for the top of the suit 11 includes shoulder pads 12a and 12b, which are joined to upper arm bands 14a and 14b and neck band 15. Elbow bands 16a and 16b and lower wrist bands 18a and 18b are
10 also connected to upper arm bands 14a and 14b by outer and inner vertical arm bands 20a and 22a and 20b and 22b, respectively. A harness chest band 24 is also connected to harness shoulder pads 12a and 12b.

 With regard to shorts 13, a harness waist band 26 is removably connected to
15 the harness chest band 24 by top side harness bands 32a and 32b. More specifically, the bottom ends of top side harness bands 32a and 32b disconnect from the waist band 26, as will be described in the following paragraph. Knee pads 34a and 34b and thigh bands 36a and 36b are joined to the waist band 26 via shorts side harness bands 42a and 42b.

20 There are multiple options for connecting upper torso/top of the suit components such as back stabilizer and oblique lower back bands (which will be discussed below) and top side harness bands 32a and 32b to the waist band 26 of the shorts. These include use of a belt loop connection, snap, Velcro or other similar means of attachment.

25 The harness bands are preferably made of non or minimal stretch material and are about 2 inches in width. An example of a suitable harness band material is durable, breathable, non-stretch nylon or nylon-polyester. The harness bands that form a loop, that is, 14, 16, 18, 24, 26 and 36 each include a means for cinching so that they may be tightened as desired. An elastic component along the side of each harness band
30 with a cinching method on either side further increases ability to provide a custom fit. Appropriate buckles or the like for this purpose are well known in the art.

The harness system provides for utilizing body parts to serve as anchors against opposing force vectors and to which resistance materials can be attached without inducing undue motion, sliding, rotation, twisting, or the like. The harness system includes largely of harness bands with adjustable circumference and interconnected
5 seams or ribbing to each other as needed to stabilize base or resilient materials against resistance bands or tubing. The harness materials are minimally stretchable or preferably non-stretch (i.e., resistant to stretch) so that resistive materials may be attached more comfortably and without sliding or movement of the garment from its original position, even during long periods of wear.

10 The key to the harness on the upper torso is fixation of downward resistance force vectors such that support occurs from the clavicle and/or superior shoulder joint; lateral fixation forces such that fixation occurs from a chest circumferential, side, and waist harnesses and that fixation for further resistance applied to the important muscles over and on either side of the vertebral column from horizontal harnesses connected to
15 side harnesses and a waist harness.

The surface area of the harness is of sufficient width such that the per unit force on the skin over the harness area of attachment with resistive materials optimizes comfort and such force per unit area because of the harness width and the interconnecting harness system preventing its dislocation optimizes resistant connected
20 materials as well as general comfort for long term wear. The harness system in a preferred embodiment utilizes a *double harness configuration* for both the lower sleeve and lower thighs. This allows two separate harness bands, interconnected by a rib or seem of harness non-stretch material to work together to resist the pull of a resistance material. As each of the harness bands exerts a slight compression into the
25 extremity, attaching a resistance material to the higher of the two bands allows both the lower band and the band to which the material is connected to together provide fixation and stabilization from movement.

The basic manner of attaching resistant materials to resilient fabric of the present invention lies in the connection of the harness system to points on the body
30 providing the best fixation against particular force vectors, such as the shoulder against force vectors pulling down, the chest against force vectors pulling sideways or obliquely, the waist against force vectors pulling upward. The harness system allows

for optional attachment of hooks so that some of muscles targeted may be reached by connecting tubing to hooks located on the harness system.

The robust harness design still allows for significant surface area to remain for the base top and shorts garment, allowing for a very breathable material with only
5 modest surface area taken away by the harness system.

With reference to Fig. 1, stretch mesh material, indicated at 52, 54a, 54b, 56, 58a and 58b is attached to portions of the body harness at the locations illustrated. This stretch mesh material attaches to the zipper-flap sections as illustrated in Figs. 4 and 5 and described in the following section.

10 Zipper-Flap Sections

The harness-zipper-flap system of the suit is illustrated in Figs. 3-5. More specifically, the locations of the zippers on the front of the suit are illustrated in the zipped and unzipped configurations in Figs. 3 and 4, respectively. The locations of the zippers on the back of the suit are illustrated in the unzipped configuration in Fig. 5.

15 Equally important to the present invention is the division of the suit into *harness-zipper-flap sections*, connection of resistant materials to the harness system via zippers and in some cases hook attachments allows for a suit that can be easily slipped on and off tension free, and worn with minimal need to adjust tension other than simply zipping the flaps closed. This allows for the ease of use, comfort and
20 effective function necessary for the present invention. As a result the wearer achieves a relatively low resistance low impact form of endurance training of targeted muscle groups with not only increased caloric expenditure spread out over the many hours of wear that are possible, but shaping, toning and increasing the strength of the targeted muscle groups.

25 Much like zipping a full suitcase, the harness-zipper-flaps provides for design and manufacture in each suit with preset tensions in the fabric as resistant materials can be permanently attached to the harness-zipper-flap junctions, and when completely zipped provide a sealed enclosure in which the suit functions optimally, but when unzipped all properties of tension are relaxed. By connecting resistance
30 materials primarily to the harness system, and designing the harness system around a series of zippered seams, with harness material on either side large sections of the suit are subdivided into flaps that can easily be sealed or opened. This greatly simplifies

manufacture, ease of insertion, ease of wear, and ease of removal. The preferred embodiment is sized either according to chest and waist circumference or a small, medium, large, extra large or like convention, as well as by resistance: using a low, moderate to high convention.

5 The wearer is able to put on both the top and shorts virtually resistance free. In a preferred embodiment the sequence is pulling over the tension free unzipped top, pulling up the tension free unzipped shorts; then cinching of harness bands along the arms, chest, and bottom rim of the shirt; then cinching the two thigh bands; attaching the top to the shorts through loops connecting to a waist harness, zippering the sides,
10 the fronts, and the backs of the top and shorts, and connecting the optional stretch tubing connections along the sides to the lower arms and from the waist to the lower thighs. As cinching the harness bands does not involve any tension (as the flaps are unzipped) each takes only moments to be tightened to a comfortable degree and then released. The actual tension of the garment is preset by its construction and
15 manufacture, and when all flaps are fully zipped the tension is restored to the garment, when unzipped the tension is relaxed. The last zipper for sealing the back portion of the top on either side actually is located along either side, coming up over either shoulder arcing slightly towards the front to simplify reach and closure.

 Sealing the wearer into the body suit in this manner simplifies manufacture via
20 connection of resistance materials to resilient fabrics tension free until worn, as well as ease of insertion and removal from the suit. Manufacture, ease of insertion and ease of removal are of critical important. The zipper harness system is therefore a key novel component of the present invention not found in nor predicted by any patents related to such suits in prior art. Further advantages and modifications that are optional to the
25 invention are readily apparent to one knowledgeable in the field from the invention of the harness–zipper–flap system of the body suit.

 Additional information regarding the harness-zipper-flap system is presented in Appendix I, entitled “The Body Sculptor™ Product Design Information”; Appendix II, entitled “Putting on the Body Sculptor™”; Appendix III, entitled “Exercise Body
30 Suit”; and Appendix IV, entitled “The S.C.U.L.P.T.R”, the disclosures of which were incorporated into and filed along with U.S. Provisional Patent Application No.

60/451,725 filed on March 4, 2003, and wherein the disclosures of which in their entirety are incorporated herein by reference.

The details of a preferable arrangement for the zippered seam 62 in Figs. 3 and 4 are presented in Figs. 6-8. Note that in Figs. 6-8, the black shaded circles, such as 64, represent snaps that engage the snaps represented by the gray shaded circles, such as 66.

Chest Compression and Resistance Bands

The chest compression band of the present invention is illustrated in Fig. 9. The *chest compression band* around the circumference of the rib cage at or above the sternum, with sufficient force of compression as detailed below, results in maximizes rib cage compression at and exhalation at the beginning of each breathing cycle (increasing spirometry volume), increased caloric expenditure via rib cage expansion against resistance with each breathing cycle, applies downward pressure prior to beginning of each breathing cycle that increases diaphragmatic involvement, further optimizes diaphragmatic breathing by providing a positive stimulus for the more energy efficient favoring of diaphragm expansion pulling the lungs open over rib cage expansion due the lower resistance per breathing cycle that results from less rib cage expansion. The result is increased volume of air per breath, as increased exhalation per breath and/or increased diaphragmatic breathing increases lower lobe lung expansion. The chest compression band can be built right into the fabric of the top or encircle via a belt loop attachment and cinching closure of the band. The design to improve pulmonary function is a key component of the present invention not predicted by prior art.

The chest compression band provides sufficient rib cage compression to 1) provide useful resistance per breathing cycle; 2) cause a more complete exhalation and rib cage compression; 3) encourage lower resistance less rib cage expansion diaphragmatic breathing; and 4) effect sufficient downward force on diaphragm to increase its contribution to each respiration. Experimentally it has been determined that about:

% elongation	average force of contraction
33%	11 lbs force Theraband gold

(Theraband gold band stretched from 35 to 47 inches elongation on 40 inch chest circumference. Force applied over a surface area of 35 x 6 inches = @ .05 lbs per in² A total force of about 11 lbs, preferably over a surface area of at least 2 inches would equal .15 lbs per in²)

- 5 Total force should be at least 5 lbs, not to exceed 20 lbs. Force per in² may range from 0.025 to 0.50 lbs.

In addition to the chest compression band, there are the following resistance bands:

- 10 a) Bicep Resistance Bands (left and right arms)
 b) Glut Resistance Bands (left and right legs)
 c) Ab Oblique Bands (left and right sides)

The locations of these bands are illustrated in Fig. 9.

Fig. 10 illustrates the following optional resistance bands and their locations:

- 15 a) Gait Tubing (left and right sides)
 b) Tricep Bands (left and right arms)
 c) Quad Bands (left and right legs)
 d) Lower Quad/Hamstring Attachments (left and right legs)

Back Stabilizer Bands

- 20 *Back stabilizer bands*, one of which is indicated at 72 in Fig. 11, force the body into a more erect posture. This is another key design feature novel to the present invention. By forcing the body into a posture that if not adjusted for with muscle exertion would be a few degrees backward of erect, a novel feature is again introduced. The human body does not tolerate being a few degrees backward of erect, while it does tolerate being hunched forward for a considerable range. Therefore this
- 25 key feature forces the abdomen to contract and bring the body into an erect posture. This results in a slight but constant form of abdominal exertion when the invention is worn. This postural feature - without any abdominal tone actually inducing a slightly backward angle past vertical - reduces the likelihood of a forward convex curvature of the lower back from "slouched" posture, and promotes and increases the likelihood of
- 30 a more natural "s" shape to the lower back while increasing abdominal tone to prevent the body from leaning backwards beyond vertical.

Fig. 11 also illustrates lower thigh bands 74a and 74b which connect the waist band 26 to the knee pads 34a and 34b.

Figs. 12 and 13 illustrate the snap attachments of the various resistance bands described above.

5 It should be appreciated that the body suit and its various components can be configured in any suitable manner and made from any suitable materials. For example, Figures 14A to 22B provide various configurations of present invention according to an embodiment.

10 In Figures 14A, 14B, 14C and 14D, various materials of the harness system are provided in both general form (a) and actual form (b). In Figures 14A and 14B, harness bands 100a and 100b are illustrated. The harness band is made from a non or minimal stretch material. The width of the harness band, in an embodiment, ranges from about ¼ inch to about 3 inches, preferably about two inches. In Figure 14B, the harness band includes a buckle 102a and 102b or other suitable fastening member.
15 Figure 14C illustrates a cinching harness band 104 that can be used to tighten the body suit configuration as desired. Figure 14D illustrates a back flap 106a and 106b that can be used to separate top and shorts into front and side and upper back flaps. Schematic views of the body suit that includes various harness materials, such as those 108, 110 and 112, respectively, discussed and described above are further illustrated in
20 Figs. 15, 16A (front view) and 16B (back view).

 In an embodiment, the chest compression band 114 is shown as incorporated into the body suit 116 of the present invention as illustrated in Fig. 17A(front view) and Fig. 17B (back view). As further shown, the waist band can be held into place by a zippered seam from the front to around the back to the other side of the front.
25 Alternatively, reinforced wide loops may be used that are either presewn or snapped into place after the belt is positioned. The belt can also via a loop, j snaps or the like affix harness components and resistance materials from the upper shirt portion. As shown in Fig. 17B, the harness system on back of shorts can provide support against the back stabilizer bands that will connect to the waist band harness.

30 In an embodiment, the back stabilizer band 118 is shown as incorporated into the body suit 120 of the present invention as illustrated in Fig. 18A(back view). Alternatively, the horizontal chest harness bands can be used as the upper point of

attachment for the back stabilizer bands. Further, stretch tubing 122 can be used to hook onto the harness where the harness also has hooks (not shown) placed in any suitable manner as shown in Fig. 18B. The back stabilizer band can be arranged in any suitable configuration such as shown in Fig. 18A or other like configuration, such as in a crossing fashion that can provide a similar effect.

In Figs. 19A and 19B, various configurations of the resistance band/harness/zipper/flap connections of the body suit 124 and 126, respectively, are shown. In an embodiment, the torso has upper chest and back resistive panels in addition to right (R) and left (L) oblique resistive panels that connect the waist, side harness and back of chest harness on each side. The arm portions of the body suit can have resistive material that places tension on the bicep; and the legs can have resistive material that places tension on the gluteus as well as the hamstrings. The harness band connections can be either built into the garment of the body suit as bands or directly sewn into the material where zipper harness systems or tubing are utilized.

In Figs. 20A and 20B, various harness/resistance band/zipper junctions 128 and 130, respectively, of the body suit in an embodiment are shown. These junctions simplify manufacture as well as ease of entering and removing the body suit. A double zipper offers added tension adjustment or relaxation. The harness material extends onto both sides of the zipper. The resistance band is fixed onto the harness via a sewn seam, glued seam, Velcro seam or the like. To further strengthen the connection, buckles or snaps may be secured after the flap is zippered as shown in Fig. 20A. Alternatively, a second zipper with optionally reinforced fabric can be secured to further strengthen the seam as shown in Fig. 20B. In an embodiment, the junction is sized in any suitable manner, such as small (S), medium (M), large (L), extra large (XL) and double extra large (XXL). This can provide for a low resistance, moderate resistance, high resistance, and extreme resistance options for wear and no further adjustment while worn of resistance.

In Figs. 21A and 21B, a double harness 132 can be incorporated into the body suit 134 in an embodiment. Both the sleeve end and lower short end take advantage of fixation properties unique to the harness system. By using a double harness at the $\frac{3}{4}$ sleeve end and the end of the thigh, with attachment to the upper of the two harnesses, a more stable fixation is achieved. The lower harness in each case helps to anchor the

harness just above it against the upward pull of the resistance material including tubing, band and/or the like. Each harness band can achieve a slight tissue compression that is connected to each other by a non-stretch harness material.

5 In Figs. 22A and 22B, a belt/waistband attachment 136 is shown as incorporated into the body suit 138 in an embodiment. The zippers are provided along a lower $\frac{1}{2}$ midline of the top front and lower $\frac{1}{3}$ of the top back. A zippered seam can then be used that connects from the front around the back and to the other side of the front.

10 Once panels are zipped into snaps, this can offer increased tension at either end of the back stabilizer band, and at least one end for all other resistive panels. There are multiple options for connecting upper torso components, such as back stabilizer bands and oblique lower back bands and side harness seams to the lower torso shorts. In an embodiment, belt loops that are robust, with connecting loops above and/or below simplify attachment of optional stretch tubing. This can allow for snap connections of
15 back stabilizer bands or other similar attachments adding a snap option adjustability. Side connections of harness seams to the waist band can be accomplished through a belt loop connection, snap, Velcro or other similar manner of attachment. Support along the back of the shorts below the waistband that is connected to a pair of harness bands on one end and secure connection just below the point where the back stabilizer
20 bands connect to the waistband further secures this important junction. To the right above a snap junction, connection from a belt loop to a back stabilizer band is shown.

In an embodiment, creation of an artificial lamellar range of motion junction allowing a full range of motion with increased resistance of the arm and/or legs when affixed to harness bands between the chest and upper arm, or between bands along the
25 upper thighs. Most clothing allows for several inches below the armpit and groin thereby making such connection possible under clothing.

It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and
30 scope of the present invention and without diminishing its intended advantages. It is therefore intended that such changes and modifications be covered by the appended claims.